

## SWITCHING REGULATOR APPLICATIONS

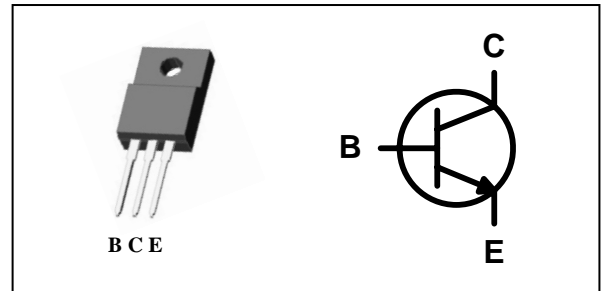
### Features

- High speed switching
- $V_{CEO(sus)} = 400V$
- Suitable for Switching Regulator and Motor Control

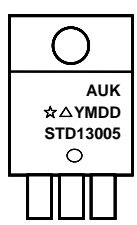
### Ordering Information

Type NO.	Marking	Package Code
STD13005F	STD13005	TO-220F-3L

### PIN Connection



### Marking Diagram

	<p>Column 1 : Manufacturer</p> <p>Column 2 : Production Information</p> <ul style="list-style-type: none"> <li>- ☆ : <math>h_{FE}</math> rank</li> <li>- △ : Factory Management Code</li> <li>- YMDD : Date Code (Year, Month, Date)</li> </ul> <p>Column 3 : Device Code</p>
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### Absolute maximum ratings

 (T<sub>c</sub>=25°C)

Characteristic	Symbol	Ratings	Unit
Collector-Base voltage	$V_{CBO}$	700	V
Collector-Emitter voltage	$V_{CEO}$	400	V
Emitter-base voltage	$V_{EBO}$	9	V
Collector current (DC)	$I_C$	4	A
Collector current (Pulse)	$I_{CM}$	8	A
Base current (DC)	$I_B$	2	A
Base current (Pulse)	$I_{BM}$	4	A
Total Power dissipation (T <sub>c</sub> =25°C)	$P_D$	30	W
Junction temperature	$T_j$	150	°C
Storage temperature	$T_{stg}$	-55 ~ 150	°C

Characteristic		Symbol	Typ.	Max	Unit
Thermal resistance	Junction-case	$R_{th(J-C)}$	-	4.16	°C/W
	Junction-ambient	$R_{th(J-a)}$	-	62.5	

## Electrical Characteristics

(Tc=25°C)

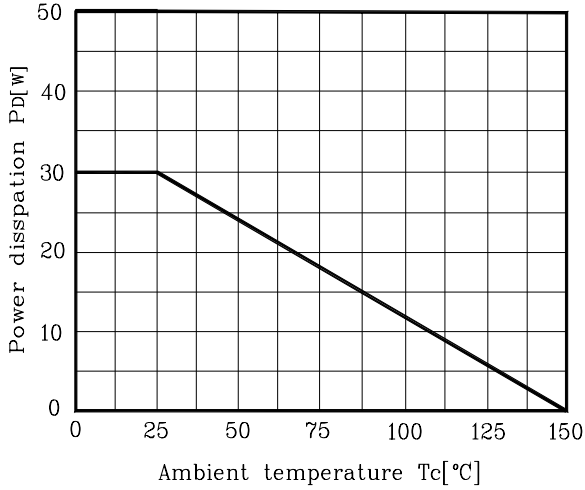
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Collector-Emitter sustaining voltage	$V_{CE(sus)}$	$I_C=10mA, I_B=0$	400	-	-	V
Collector cut-off current	$I_{CEV}$	$V_{CEV}=\text{Rated Value}$ $V_{BE(off)}=1.5V$	-	-	1	mA
Emitter cut-off current	$I_{EBO}$	$V_{EB}=9V, I_C=0$	-	-	1	mA
DC Current gain	$h_{FE}^*$	$I_C=1A, V_{CE}=5V^{**}$	15	-	40	
		$I_C=2A, V_{CE}=5V$	8	-	40	
Collector-Emitter saturation voltage	$V_{CE(sat)}^*$	$I_C=1A, I_B=0.2A$	-	-	0.5	V
		$I_C=2A, I_B=0.5A$	-	-	0.6	
		$I_C=4A, I_B=1A$	-	-	1	
Base-Emitter saturation voltage	$V_{BE(sat)}^*$	$I_C=1A, I_B=0.2A$	-	-	1.2	V
		$I_C=2A, I_B=0.5A$	-	-	1.6	
Transition frequency	$f_T$	$V_{CB}=10V, I_C=0.5A, f=1MHz$	-	4	-	MHz
Output capacitance	$C_{ob}$	$V_{CB}=10V, I_E=0, f=0.1MHz$	-	65	-	pF
Turn on Time	$t_{ON}$	$V_{CC}=125V, I_C=2A, R_L=62.5\Omega$ $I_{B1}=-I_{B2}=0.4A$	-	0.8	-	$\mu s$
Storage Time	$t_{STG}$		-	4	-	
Fall Time	$t_F$		-	0.9	-	

\* Pulse test:  $PW \leq 300 \mu s$ , Duty cycle  $\leq 2\%$  Pulse

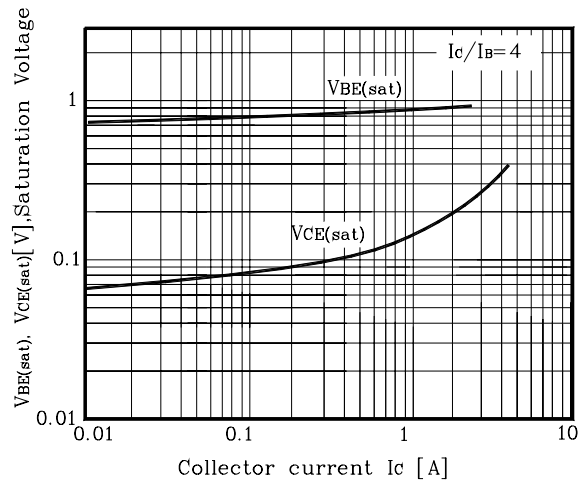
\*\*  $h_{FE}$  rank / A : 15~30, B : 25~40

## Electrical Characteristic Curves

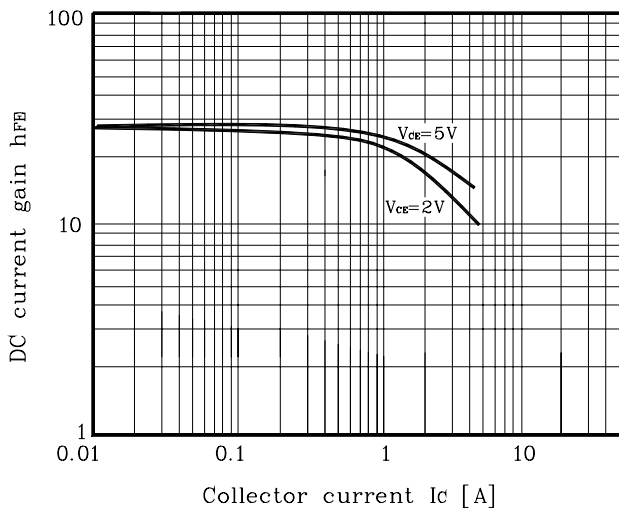
**Fig. 1  $P_D - T_C$**



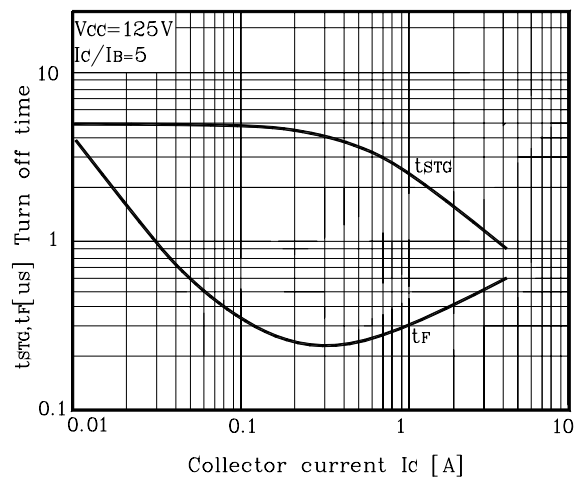
**Fig. 2  $V_{BE(sat)}, V_{CE(sat)} - I_C$**



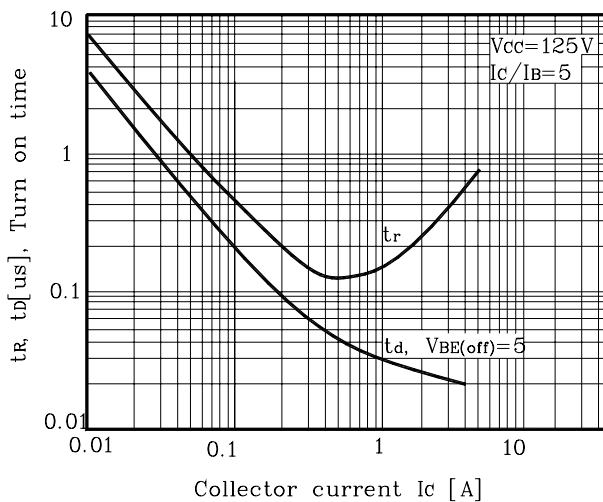
**Fig. 3  $h_{FE} - I_C$**



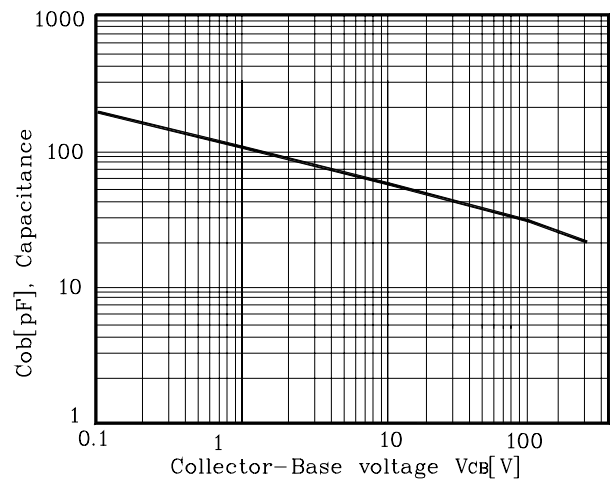
**Fig. 4 Turn off time**



**Fig. 5 Turn on time**



**Fig. 6 Capacitance**



Electrical Characteristic Curves

Fig. 7 Forward Safe Operating Area

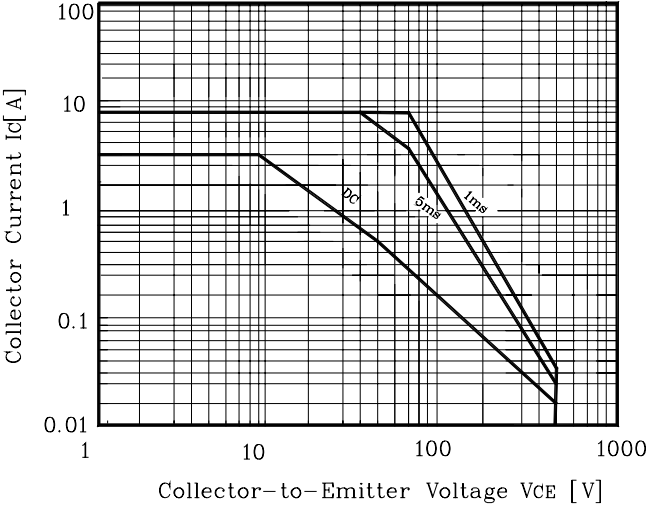
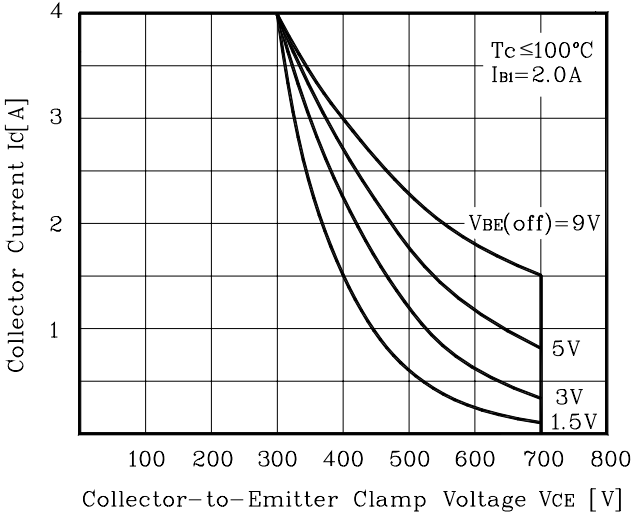
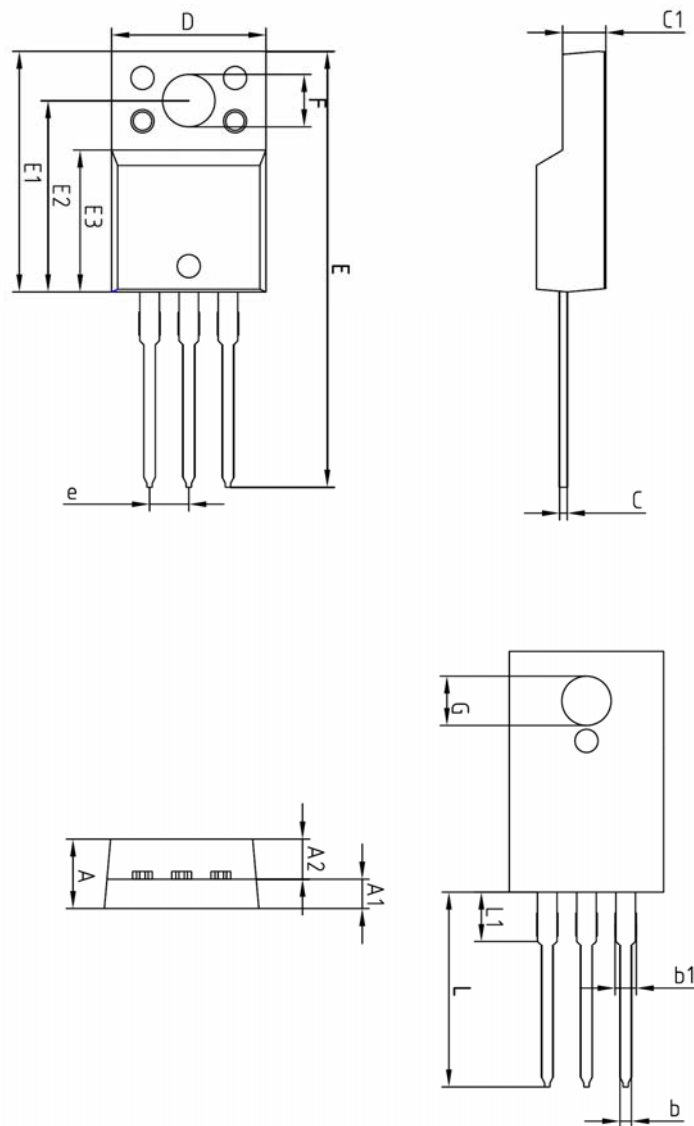


Fig. 8 Reverse Safe Operating Area



## Outline Dimension



SYMBOL	MILLIMETERS			NOTE
	MINIMUM	NOMINAL	MAXIMUM	
A	-	-	4.60	
A1	2.45	2.50	2.55	
A2	1.95	2.00	2.05	
b	0.65	0.75	0.85	
b1	1.07	1.27	1.47	
C	0.40	0.50	0.60	
C1	2.70	2.80	2.90	
D	9.90	10.00	10.10	
E	28.00	-	28.60	
E1	15.50	15.60	15.70	
E2	12.30	12.40	12.50	
E3	9.15	9.20	9.25	
F	3.30	3.40	3.50	
G	3.10	3.20	3.30	
e	2.54 BSC			
L	12.40	-	13.00	
L1	3.46 BSC			

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